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13. ABSTRACT (Maximum 200 words) <p>The direct costs of medical care and the indirect costs of absenteeism to society attributed to low back pain are enormous. Prior research conducted on the phenomena of low back pain have been highly controversial and conflicting as researchers attempt to determine the causes and the best treatment alternatives based on cost and outcome effectiveness. With the continued cost reduction influences of managed care in the delivery of health care, solutions to the low back pain problem will be those alternatives that are proven to be efficient and effective, regardless of the provider type delivering the medical care, including chiropractors. For the first time in history, the Department of Defense offers chiropractic services within its medical treatment facilities under the Chiropractic Health Care Demonstration project (CHCDP). The purpose of this Graduate Management Project is to provide a methodology to evaluate the outcome effectiveness of chiropractic treatment rendered to patients with lower back pain under the CHCDP. Using an Oswestry pain questionnaire, patient perception of functional disability from lower back pain was gauged before and after treatment was provided. Data analysis from 40 sample patients provided strong evidence to support this project's research hypothesis in that patient functional disability scores will improve over time as a result of chiropractic treatment for low back pain.</p>				
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GRADUATE PROGRAM IN HEALTH CARE ADMINISTRATION

A FUNCTIONAL OUTCOME (DISABILITY) STUDY OF
PATIENTS TREATED FOR LOW BACK PAIN UNDER THE CHIROPRACTOR
HEALTH CARE DEMONSTRATION PROJECT AT NAVAL HOSPITAL,
JACKSONVILLE

A GRADUATE MANAGEMENT PROJECT (GMP)
SUBMITTED TO FACULTY READER
IN PARTIAL FULFILLMENT
OF REQUIREMENTS FOR THE ADMINISTRATIVE RESIDENCY

BY
LIEUTENANT COMMANDER ROGER L. SELLERS, MSC, USN

JACKSONVILLE, FLORIDA

JUNE 1996

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The enthusiastic support and mentoring obtained from Commander Robert Quinones during this project, provided me with the strategic insight and impetus to overcome encountered obstacles to bring the project to fruition. His direct leadership and personable demeanor were truly inspirational.

ABSTRACT

The direct costs of medical care and the indirect costs of absenteeism to society attributed to low back pain are enormous. Prior research conducted on the phenomena of low back pain have been highly controversial and conflicting as researchers attempt to determine the causes and the best treatment alternatives based on cost and outcome effectiveness. With the continued cost reduction influences of managed care in the delivery of health care, solutions to the low back pain problem will be those alternatives that are proven to be efficient and effective, regardless of the provider type delivering the medical care, including chiropractors. For the first time in history, the Department of Defense offers chiropractic services within its medical treatment facilities under the Chiropractic Health Care Demonstration project (CHCDP). The purpose of this Graduate Management Project is to provide a methodology to evaluate the outcome effectiveness of chiropractic treatment rendered to patients with lower back pain under the CHCDP. Using an Oswestry pain questionnaire, patient perception of functional disability from lower back pain was gauged before and after treatment was provided. Data analysis from 40 sample patients provided strong evidence to

support this project's research hypothesis in that patient functional disability scores will improve over time as a result of chiropractic treatment for low back pain. On average, a decline of 11.4 disability scale points would be expected. These results were statistically significant: $t(39), = 5.07, p < .001$. Variance analysis of the results showed that R^2 for chiropractic treatment was calculated at .1222 with a subject R^2 of .6923 for a total variance accounted for at 81.45 percent. For comparative purposes, a similar analysis was completed for 97 physical therapy patients treated for low back pain. This showed that on average, a patient's disability score would improve by 7.1 scale points. These results were also statistically significant: $t(96), = 6.08, p < .001$. These findings suggest that both chiropractic and physical therapy treatment of low back pain at Naval Hospital, Jacksonville, improves patient perceived functional disability. Further outcomes and cost analysis (Activity-based Cost) studies by the CHCDP Oversight Committee are needed.

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INTRODUCTION

Conditions Prompting the Study

The Chiropractic profession has been scarred with a turbulent history of controversy regarding their professional acceptance from traditional health care providers. Questions addressing the effectiveness of "chiropractic manipulation" in the treatment of lower back pain have been debated and researched for years. Coupled with an almost epidemic number of people suffering from lower back pain and with the cost conscious emergence of managed care in the health care industry, the functional effectiveness of chiropractic treatment demands further applied management research as a valid treatment alternative.

Not long ago, chiropractic treatment was derided as outright quackery by mainstream political medicine. However, floods of recent research studies have shown that spinal manipulation in general, and chiropractic treatment in particular, offer a safe and effective alternative for many neuro-musculoskeletal pain conditions. While this growing body of research is moving the chiropractic

profession away from the fringes of medical practice, chiropractors still have many political and economic obstacles to overcome before they will be seen as truly "mainstream" practitioners (Lauretti, 1995). However, indications are that chiropractic services are making progress. For example, for the first time in its history, the Department of Defense (DoD) Military Health Service System (MHSS) offers chiropractic services to its beneficiaries.

Chiropractic Health Care Demonstration Project

With the initiation of a congressionally mandated chiropractic demonstration project in the DoD MHSS, a need exists within DoD to establish a methodology to evaluate those services provided. As a result of legislation introduced last year by Senator Strom Thurmond (R-SC), the 1995 National Defense Authorization Act directed the Secretary of Defense to conduct a three-year demonstration to evaluate the feasibility and advisability of providing chiropractic care in the MHSS. The act mandated that the Chiropractic Health Care Demonstration Program (CHCDP) be conducted at ten military treatment facilities (MTFs) during fiscal years 1995 through 1997 (1995 National Defense Authorization Act, Sec. 731). The participating bases include:

Participating CHCDP MTFs

TABLE 1

Army	Navy	Air Force
FT Benning, GA	Jacksonville, FL	Scott AFB, IL
FT Carson, CO	Camp Lejeune, NC	Travis AFB, CA
FT Jackson, SC	Camp Pendleton, CA	Offutt AFB, NE
FT Sill, OK		

The Act further mandated the establishment of an Oversight Advisory Committee which is responsible for an evaluation of the CHCDP.

Statement of the Problem

While Naval Hospital, Jacksonville anxiously awaits the demonstration project evaluation results, an immediate need exists at this MTF to determine the effectiveness of chiropractic care delivered to its beneficiaries. The purpose of this Graduate Management Project is to provide a methodology to evaluate the outcome effectiveness of chiropractic treatment rendered to patients with lower back pain. Specifically, this project will determine the magnitude of change in the patient's perception of functional disability from lower back pain before and after chiropractic treatment is provided. For research purposes, a sample of lower back pain patients treated by physical

therapists at Naval Hospital, Jacksonville will be used for comparative reasons. It is recognized that while this methodology covers only a small portion of what the Oversight Committee is required to study (outcomes, cost effectiveness, patient satisfaction, MHSS integration, etc.), it will provide this hospital with medical outcome information to evaluate chiropractic services for a common patient complaint (low back pain).

Literature Review

Chiropractor Acceptance

Chiropractic is a health care system originating in 1985 when Daniel David Palmer formulated the theory of subluxation (Shekelle 1994). Subluxation is defined as "a motion segment, in which alignment, movement integrity and/or physiological functions are altered although contact between the joint surfaces remains intact" (American Chiropractic Association 1995). Since its origin, the practice of chiropractic has been opposed by organized medicine and many medical doctors (Ballantine 1972). Opposition reached its zenith in 1963 with the establishment of the Committee on Quackery by the American Medical Association, with the secret agenda of containing and eliminating the chiropractic profession (Shekelle 1994). This committee was disbanded in 1975 and the American

Medical Association (AMA) was successfully sued for engaging in unlawful restraint of trade. In *Wilk v. American Medical Association* (1987), a permanent injunction was ordered against the AMA prohibiting the impediment of the chiropractic profession to combat the lingering effects of the restraint of trade (Boyle and Zucker 1994). Despite the illegal conspiracy to restrain the chiropractic profession, the number of chiropractors and the number of chiropractic patients continued to grow, "with a doubling of each in the past 20 years" (Shekelle 1994, 1). Chiropractors are now accepted as a legitimate healing profession by the public and an increasing number of physicians (Manga et al. 1993). According to a Gallup Poll conducted for the American Chiropractic Association, more than 18 million Americans have sought chiropractic care (Chiropractic Online 1995). Data corroborating physician acceptance indicates that 20% of chiropractor referrals now come from physicians (Manga et al. 1993).

Chiropractic Services and Managed Care

Health care delivery in this country has undergone some dramatic changes in the last few years. Managed care, mega-mergers, patient focused care, product-line management, utilization review, and demands for cost effectiveness are just a few of the drivers affecting how health care is

delivered. These drivers have had an effect on chiropractic health care delivery (Manga et al. 1993).

Under the guise of cost effectiveness, health care delivery organizations are reassessing their staffing requirements with the use of alternate health care providers. There is tremendous potential in using manpower substitution for improving the technical efficiency in the production of a wide range of health care services (Manga and Campbell 1993). The potential is there for professions other than medical doctors to assume greater responsibilities in delivering health care (Manga et al. 1993). This manpower substitution theory has advanced the acceptance of chiropractors as organizations implement strategies to improve efficiencies and contain costs. As an indicator of this acceptance, in 1970 there were 19,000 persons employed in chiropractor offices. In 1989, this number had risen to 97,000 (Darr, Longest, and Rakich 1994).

Dr. Lowry Martin, Chairman of the Board of the American Chiropractic Association, believes a recently released federal study validating spinal manipulation as an effective, drug-free initial treatment for acute low back problems in adults should "throw open the doors of managed health care plans to chiropractors" (Chiropractic Online 1995). He believes the end result will be significant

savings to the nation's overall health care system. "This study validates a form of treatment doctors of chiropractic have been performing for nearly a century. Spinal manipulation is effective. It gets low back patients on their feet and back to work faster than any other form of care. That's why it would be a poor decision for managed care plans not to allow enrollees direct access to doctors of chiropractic, who are uniquely trained and extensively experienced in providing spinal manipulation" (Chiropractic Online 1995). As the DoD MHSS transitions to managed care through TRICARE, the need to evaluate the effectiveness and efficiency of treatment alternatives such as chiropractic services appear to be in its best interests.

Patient Satisfaction

Patient satisfaction is a major factor in health outcome measurement. It has emerged as one of the critical outcomes of medical care because of increasing emphasis on patients as consumers of services in the medical marketplace (Davies and Ware 1988). According to a 1994 Harris poll, patients are more satisfied with chiropractic treatment for back problems than any other form of care (Chiropractic Online 1995). With high patient satisfaction, it is no surprise that chiropractic service popularity is increasing as a treatment of choice for low back pain. About two-

thirds of all patient visits for back pain are made to chiropractors (Murt 1986).

The ability of the chiropractic profession to communicate effectively with patients and enhance the doctor-patient relationship is seen as a major contributor to high patient satisfaction (Oths 1994). A recent study in the New England Journal of Medicine pointed out that patients preferred the quality and comprehensiveness of the doctor of chiropractic's approach to the examination. Patients found chiropractors to provide better history-taking during clinical examinations and felt they spend more time explaining the problems that can cause low back pain (Carey et al. 1995). In the language of economics, the fact patients choose chiropractic care over physician care despite higher copayment costs is "revealed preference," indicating greater patient satisfaction with chiropractic care for low back pain (Manga et al. 1993).

Given the current climate of cost containment and increasing concern about the quality of medical care, the patient's voice will continue to grow in importance in the medical marketplace (Marshall et al. 1993). These trends indicate that making chiropractic services available within the DOD MHSS should enhance customer satisfaction with treatments rendered for low back pain. As an example, in

the first two months of the CHCDP at Naval Hospital, Camp Pendleton "two thirds of the patients report significant improvement following their chiropractic treatment and no patients have reported worsening of symptoms" (Naval Service Medical News 1995-49).

Lower Back Pain - An Epidemic

Acute low back pain is one of the most common reasons for consulting a primary care physician in industrialized countries (Malmivaara et al. 1995). The magnitude of low back pain problems continues to grow. For example, "in the decade from 1971 to 1981, the number of individuals disabled from low back pain grew at a rate 14 times that of the population growth" (DeRosa and Porterfield 1992). Becoming the largest single cause of absenteeism in 1988-89, there were 52.6 million certified working days lost in Britain (Frank 1993). In the United States, it is second only to upper respiratory complaints as a cause of work absenteeism (Deyo and Tsui-Wu 1987).

The direct costs of medical care and the indirect costs to society of absenteeism from work due to backache are huge (Deyo and Tsui-Wu 1987). The magnitude of the economic burden has been estimated at \$40 to \$50 billion annually, which includes medical, compensation, legal, vocational retraining, and lost productivity costs (Mayer and Gatchel

1988). The cost of medical care alone was estimated at \$17.9 billion in 1988 (Deyo et al. 1991). Astoundingly, it is estimated that 80% of all people will experience back pain during their life (Brodie et al. 1990). According to the American Chiropractic Association, 20% of all American military medical discharges are due to low back pain (Chiropractic Online 1995). These figures appear to validate the tremendous magnitude of the lower back pain problem.

Lower back pain has been found to account for the most hospitalizations and surgery in the United States, with 50% of lower back pain sufferers being hospitalized and 22% undergoing surgery for their affliction (Kramer et al. 1983). "Medical back problems comprised the second most common Diagnostic Related Group for all hospital discharges in 1987, following only natural childbirth" (Deyo et al. 1991, 142). It seems reasonable to conclude that the impact of lower back pain on society is explicitly burdensome, yet, the problem grows. Lower back pain is increasing faster than any other form of chronic disability, "we are now facing an epidemic" (Waddell 1993, 317).

Pain

Pain has been defined as "unpleasant sensory and emotional experience associated with actual or potential

tissue damage, or described in terms of such damage" (Subcommittee on Taxonomy 1976). Therefore, by its very definition, pain is not purely a physical experience. Mayer has postulated that the reason why pain cannot be quantified by objective measures is that pain is a subjective experience having multifactorial origins (Mayer 1992). Pain is a complex perception that consists of sensory (localizing and discriminating), emotional (unpleasant, motivational), and cognitive (evaluative processing) components. Pain is ultimately a psychological construct and is therefore subject to modification by emotions, thoughts, and both internal and external environments (Melzack 1983). Accordingly, it is unreasonable to expect that all components of lower back pain can be measured exclusively by objective measures.

Low Back Pain Pathology

The ability to accurately determine the pathology underlying the complaints of a patient with low back pain remains problematic for health care providers. Defining low back pain and its causes are difficult (Spitzer 1987). In the Presidential Address of the North American Spine Society, Haldeman stated, "We do not know the cause of back pain" (Haldeman 1990). No one has yet to identify the specific anatomy and physiology of a unique pain source in

the spine. It is easy to see that approximately 23 percent of a physical therapist's patient care time involves evaluating and treating patients with lower back pain (Binkley et al. 1993).

Nonspecific low back pain is by no means a homogenous symptom and may have many causes (Ernst 1995). In support of this theory, Nachemson demonstrated that only 20% of patients with acute low back pain can be given a diagnosis based on objective physical abnormalities (Nachemson 1995). In addition, most demonstrable pathology is also prevalent in the symptom-free population, therefore, it is questionable whether the presence of pathology is associated with the patient's source of back pain (Haldeman et al. 1988).

Outcome Measure of Low Back Pain

Society is placing increasing demands of accountability on the health care industry relative to the efficacy of treatments as shown by improved patient outcomes associated with that treatment (DeRosa 1993). This includes outcomes resulting from treatment for low back pain. Unfortunately, outcome measurement for the treatment of low back pain is not as rudimentary as it seems.

The failure of physical measures relative to lower back pain has resulted in health care providers relying heavily

on a patient's history and subjective pain information to determine a medical diagnosis (Laros 1991). Objective physical measures of function (leg raising, range of motion, muscle strength, etc.) for lower back pain have resulted in imprecise, unreliable, and poorly interpreted assessments (Waddell et al. 1982). Subjective information available from the patient to assist in the clinical evaluation of lower back pain includes attitudes, beliefs, illness behavior, and psychological distress (Haldeman 1990). In a survey of physical therapists regarding attitudes and treatment preferences of lower back pain, the variation of responses received indicated a strong need for further outcomes research to identify the most effective treatment approach (Battie et al. 1994).

Adding to the outcome measurement problem is again, the fact that diagnoses of pathology is virtually impossible in the majority of patients with low back syndrome (Valkenburg and Haanen 1982). Waddell examined physical impairment, pain, and disability for patients with low back pain (Figure 1). The relationship between physical impairment and disability has been shown to be twice as strong as the relationship between physical impairment and pain (Waddell et al. 1984). To overcome the diagnosis limitations and to use Waddell's pain relationship theory, the use of a self-

report questionnaire that includes both physical and psychological components become a method of choice to measure outcomes of lower back pain treatment.

A self-report is (1) easy to administer; (2) there is no participation by the treating clinician, and bias of the clinician is therefore eliminated; (3) the items reflect functional activities that are impossible to replicate in the clinic based on physical examination; and, (4) there is documented reliability for the measure (Erhard et al. 1994). The use of self-report measures of health status in clinical investigations involving patients with lower back syndrome is well supported (Deyo 1988). Deyo et al. proposed measuring the patient's physical and psychosocial function concomitantly by using a disability questionnaire (Deyo and Diehl 1983).

The correlation between physical impairment and disability ($r = 0.54$) was shown to be higher than physical impairment and pain which had a correlation of $r = 0.27$ (Rahe, Mahan, and Arthur 1970). This relationship is represented in Figure 1. Since disability reports have a stronger correlation than pain to physical impairment, a disability measure was considered a better measure than pain when attempting to assess the report of lower back pain.

Disability scores establish the patient's perception of

Physical Impairment, Pain, Disability

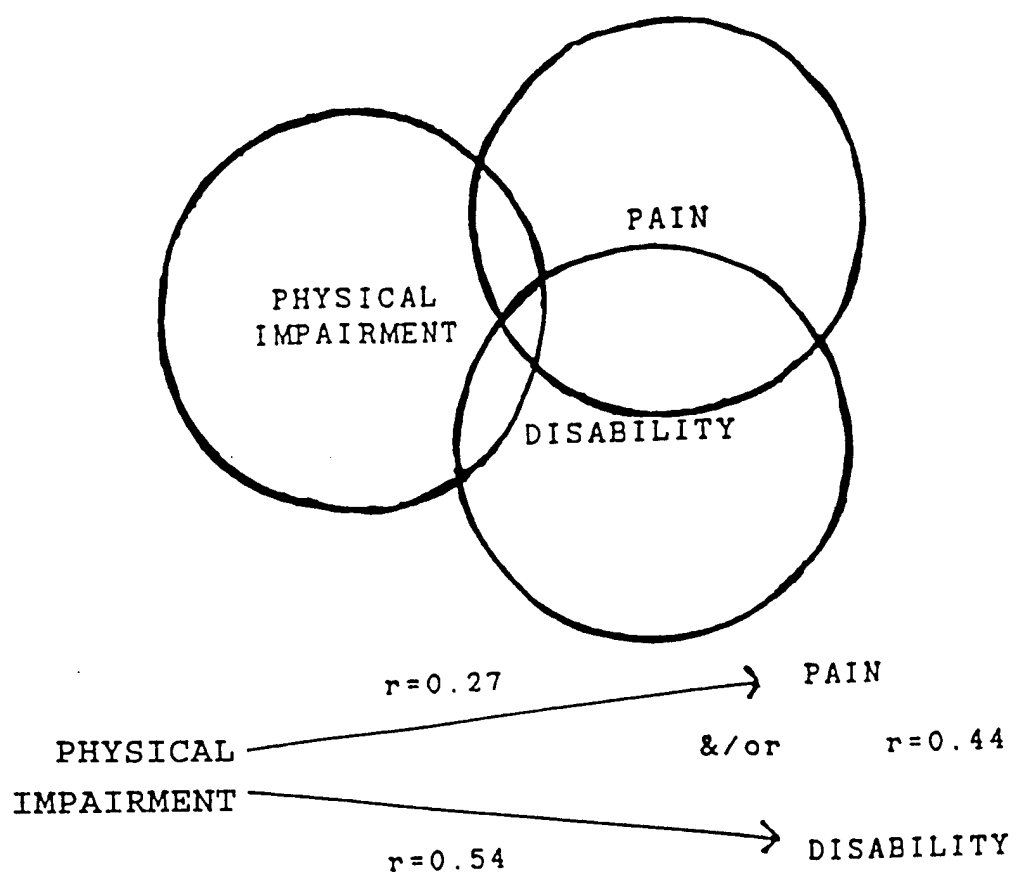


Figure 1. Modified from Waddell (1987)

pain and their present health status (Fairbank et al. 1980). The disability questionnaire tries to quantify symptoms, function, and behavior directly (Deyo 1988). While disability measures do not answer the question of whether the pain is physical or psychological, it does contain elements of both components.

Causes of Low Back Pain

Many occupational elements have a bearing on the prevalence of lower back pain (Manga et al. 1993). Activities such as truck driving, lifting, carrying, pulling, pushing, and twisting have been suggested as causes of low back pain (Harris and Brigham 1990). Unlike the etiology of many other diseases and conditions, causes of lower back pain are numerous, diverse, and not that well understood. Cases of lower back pain tend to be attributed to work related factors even though most of the cases do not have a clear anatomical cause (Manga et al. 1993).

Physical therapists tend to view disk problems as the underlying cause of low back pain followed by muscle strains. These beliefs are consonant with the popularity of various exercises and the McKenzie approach, which is based on the theory that changes in the disk induced by mechanical stresses are responsible, in great part, for changes in symptoms (Battie et al. 1994). In a survey of family

physicians and chiropractors, muscle strain was rated as the leading cause of back pain by the physicians. The chiropractors rated vertebral subluxation as the leading cause (Cherkin 1988). The relationship between beliefs of causation and treatment selection is apparent, with manipulation being the most common treatment method of choice among chiropractors (Battie et al. 1994). This fact was validated by the Rand Health Insurance Experiment which reported that 94% of all manipulation services are provided by chiropractors (Shekelle et al. 1993).

Treatment of Lower Back Pain

Physicians, chiropractors, physical therapists, and other health care providers offer about 36 therapeutic modalities for the treatment of lower back pain (Manga et al. 1993). Unfortunately, the proliferation of new technology and advanced clinical skills for the assessment and treatment of spinal pain has not influenced the overall incidence, morbidity, cost, or disability related to spinal disorders (Haldeman 1990).

According to Waddell, in determining a plan of treatment for a patient presenting to a physician with low back pain, medical assessment and treatment is influenced more by the patient's distress and illness behavior than by the actual physical disorder. Medical treatment may in

theory be prescribed for physical indications, but in practice both conservative and surgical treatment for a poorly understood condition as low back pain is determined to a much greater extent than most physicians realize, or would like to admit, by the patient's distress and illness behavior (Waddell 1987).

Another familiar problem relative to the proper treatment of low back pain goes back to diagnosis. As mentioned earlier, backache is common yet its routine medical assessment is imprecise, unreliable, and poorly interpreted (Waddell et al. 1982). A dilemma exists in the proper diagnosis of patients suffering from low back pain. The precise diagnosis is unknown in 80% to 90% of patients with low back pain (Spratt et al. 1990). The dilemma of diagnosis for activity related low back pain is complicated even further because patients with low back pain often receive many different diagnoses over time (Spitzer et al. 1987).

Treatment Research

Only about 15% of all medical interventions are supported by solid scientific evidence, according to David M. Edy, M.D., Ph.D., Professor of Health Policy and Management at Duke University, North Carolina. In contrast, the breadth of existing research dedicated to chiropractic

efficacy is substantial per Paul G. Shekelle, M.D., MPH, of the Rand Corporation (Chiropractic Online 1995).

Overall, research related to the treatment of lower back pain is plentiful yet controversial. For example, while physicians commonly prescribe bed rest for acute low back pain, few controlled clinical trials have assessed its effectiveness. Malmivaara reported a number of conflicting studies regarding the benefits of bed rest. A 1980 study determined that among military recruits with low back pain, bed rest led to more rapid recovery than remaining on foot (Wiesal et al. 1980). However, Malmivaara's randomized control trial study showed that patients with acute back pain should continue ordinary activities within the limits permitted by the pain. In his study, those patients maintaining activity had more rapid recovery times than those patients treated with bed rest or back-mobilizing exercises. During the study, participants assessed their functional disability status using an Oswestry pain questionnaire (Malmivaara 1995).

Patients with low back pain account for approximately 36% to 53% of patient visits in a physical therapy clinic (Battie et al. 1994). Physical therapists are likely to use a variety of treatment modalities. The McKenzie method was said to be the most popular approach for managing patients

with low back pain. Education in body mechanics, aerobics, and strengthening exercises were among the most common treatment preferences. The most frequent passive modality was ultrasound, but ice was most recommended for acute low back pain with sciatica (Battie et al. 1994).

Astonishingly, many lower back treatment modalities such as traction, William's flexion and extension exercises, X-ray therapy, short-wave therapy, ultrasound therapy, muscle relaxants, biofeedback programs, anti-inflammatory drugs, injections, and manipulations of various types have failed to demonstrate any significant effect on the natural history of return to work (Nachemson 1985). Considering the benefit of prescribing exercise as part of the treatment regimen, prior studies are tainted with methodological flaws (Battie et al. 1994). Because of this, no conclusion can be drawn about whether exercise therapy is better than other conservative treatments for back pain or whether a specific type of exercise is more effective (Koes et al. 1992). This lack of a consensus about the management of low back pain exists across the spectrum of health care providers (Battie et al. 1994). This significant controversy and confusion have led to the selection of back pain as one of the first nationally targeted problems for outcomes assessment research funded by the Agency for Health Care Policy and

Research (Deyo, Cherkin and Conrad 1990).

The Agency for Health Care Policy and Research (AHCPR) produced *Clinical Practice Guideline Number 14: Acute Lower Back Pain Problems in Adults* in December 1994. This guideline was developed based on extensive literature reviews, evaluation of empirical evidence, peer/field reviews, and the professional judgement of the selected panel and other multi-disciplinary consultants. A number of conclusions regarding treatment of lower back pain were reached including: 1) There was no evidence of benefit from the application of physical agents and modalities such as heat, massage, ultrasound, TENS, and biofeedback techniques; 2) Prescribing bed rest more than four days is not helpful and may further debilitate the patient; 3) Low-stress aerobics can be started in first two weeks of symptoms; 4) Recovering patients should return to work as soon as possible; and 5) Relief of low back pain discomfort can be accomplished most safely with nonprescription medication and/or spinal manipulation (Bigos et al. 1994). These guidelines if implemented, are estimated to save as much as \$5 billion annually (Carey et al. 1995).

Interestingly enough, it may not matter from an outcome standpoint, as to what type of health care provider a patient seeks treatment. A recently reported study in the

New England Journal of Medicine concluded: "among patients with acute low back pain, the outcomes are similar whether they receive care from primary care practitioners, chiropractors, or orthopedic surgeons" (Carey et al. 1995).

Chiropractic Treatment of Low Back Pain

Low back pain is the most common symptom of people using chiropractic services, and spinal manipulation accounts for the majority of services provided (Shekelle 1994). Care from doctors of chiropractic emphasizes spinal manipulation, which has been shown to be effective in several randomized trials (Shekelle et al. 1991). Chiropractors do however, use other forms of therapeutic procedures in the treatment of low back pain. A recent survey indicates that chiropractors commonly use corrective/therapy exercises, ice pack/cryotherapy, bracing, nutritional counseling, bed rest, orthotics, hot packs/moist heat, traction, electrical stimulation, and massage therapy (Manga et al. 1993). For the management of low back pain, modern chiropractors use a "holistic approach that encompasses manipulation, education, and regard for environmental, nutritional, and psychotherapeutic factors" (Raftis and Warfield 1989, 90).

Manipulation

Manipulation is one of several forms of manual therapy.

Manual therapy is treatment using any of a group of procedures by which the doctor's hands directly contact the patient's body to treat the joints and related soft tissues of the body (Gatterman and Hansen 1994). Spinal manipulation, which is the most common form of manipulation for treatment of musculoskeletal complaints, has been used for centuries (Shekelle et al. 1991).

The field of manual therapy has been experiencing rapid growth. One growing pain associated with this growth is the inconsistent use of terms. To get a sense of just how much terminology in manual therapy is affected by different schools of thought "ADVANCE asked five health care providers and got five completely different responses" (Adams 1995). Stanley Paris, Ph.D. P.T., explained that in the 1960s the word "manipulation" had a negative connotation in the minds of American manual therapists because it was associated with chiropractic medicine. Dr. Paris explained that chiropractic manipulation is the principal tool used to adjust the spine to affect changes in alignment in order to relieve nerve root pressure. However, in manual therapy, therapists use manipulation to mobilize the spine in order to improve function (Adams 1995). Dr. Paris added that most physical therapists do not employ high velocity thrusts as chiropractors do, but more persuasive measures in nature

like stretching and oscillations.

Spinal manipulation has also been defined as an abrupt passive movement of a vertebra beyond its physiological range but within its anatomical range (Spitzer 1987). It is noted that spinal manipulation encompasses many different techniques. Generally, they can be categorized as one of two types: nonspecific long-lever manipulations and specific, short-lever, high velocity spinal adjustments (Buerger 1984). Long-lever manipulations use the femur, shoulder, head, or pelvis to manipulate the spine in a nonspecific manner, whereas short-lever spinal adjustments use a specific contact point on a process of a vertebral joint. It is this second method which is closely identified with chiropractors (Shekelle et al. 1993). This "chiropractic adjustment" is a treatment procedure that is carefully administered to specific joints of the body to correct subluxations. The usual characteristic is a thrust - a brief, sudden, and carefully administered "impulsion" that is given at the end of the normal passive range of movement. It is usually accompanied by a cracking noise (Cassidy and Kirkaldy-Willis 1988).

A review of studies on manipulation showed little long term benefits (Jayson 1986). However, manual therapy including manipulation has been found effective in reducing

pain of longer duration (Koes et al. 1992). A study of patients with acute and chronic pain showed early benefits from manipulation (Mathews et al. 1987). Collectively, the studies on manipulation suggest that they are effective (Frank 1993). Shekelle et al. conducted a complete review of manipulation efficacy studies and concluded that spinal manipulation does hasten recovery from acute uncomplicated low back pain, but its long-term effect, either in preventing the development of chronic low back pain or in preventing recurrences of acute low back pain, is unknown (Shekelle et al. 1993). "Our data synthesis shows that spinal manipulation is of benefit to patients with acute low back pain without sciatica, increasing the patient's probability of recovery at four weeks by about 30%, when compared with patients treated with sham manipulation or therapies that do not include manipulation" (Shekelle 1994, 13).

Concluding that spinal manipulation is a safe and effective initial form of treatment, the Agency for Health Care Policy and Research recommended that doctors and patients consider the most conservative forms of treatment for low back pain (Bigos et al. 1994). The primary physician should exhaust all possibilities of conservative treatment before referring a low back patient to a surgeon

(Ryan 1993). One claim from an eminent neurosurgeon estimated that approximately 90% of the 250,000 back surgeries performed annually in the United States could be avoided (Manga et al. 1993). It appears that there is strong evidence to support the use of manipulation in the treatment of low back pain.

Chiropractic Cost Effectiveness

The issue of whether chiropractic services for low back pain are more cost effective when compared to health care services provided by traditional health care providers has been debated and researched for years. Some researchers hypothesize that since recovery time from treatment of acute lower back pain is the same regardless of the type of provider seen, the decision of which provider to use, should be made based on the marginal costs of services provided (Carey et al. 1995). As reported by the Rand Health Insurance Experiment, patients average 10.4 visits to chiropractors per episode of care as compared to a mean of 2.3 visits to primary care physicians (Shekelle, Louie and Markovich 1995). The higher number of treatments provided by the chiropractors more than offsets any apparent ancillary cost advantage according to Shekelle. Unfortunately, scientific literature is not helpful in determining the appropriate frequency or duration of care

for chiropractic services (Shekelle et al. 1993). For acute low back pain, the best care may be minimal care (Carey et al. 1995).

Earlier studies on the cost effectiveness of chiropractic services are highly contradictory. Stano reported that chiropractic services for low back pain were less than those services provided by physicians primarily because of the higher cost of inpatient utilization (Stano 1993). Using regression analysis, Stano showed chiropractic care as a predictor of lower costs. In another study, Jarvis found that costs for care in general were not statistically significantly different between chiropractors and physicians (Jarvis, Morris and Phillips 1991). Still, in another study, Dean and Schmidt concluded that the cost of treating the "condition" is significantly higher for medical physicians than for chiropractors (Dean and Schmidt 1992).

In comparing time lost from work and the total cost of care between workers' compensation patients treated by chiropractors and by medical doctors, it was determined that chiropractic care was considerably more economical (Wolk 1988). However, other researchers have found flaws in the methodology used in workers' compensation studies and conclude that "the cost effectiveness of chiropractic care

for worker's compensation cases is not convincingly proven" (Assendelft and Bouter 1993).

In a study funded by the Ontario Ministry of Health, the often referred to *Manga Report*, concluded there is an overwhelming body of evidence indicating that chiropractic management of low back pain is more cost effective than medical management. Further, the report states there would be highly significant cost savings if more management of lower back pain was transferred from physicians to chiropractors (Manga et al. 1993). These conclusions were reached by reviewing existing studies which indicated the savings would accrue because of lower ancillary and hospitalization costs associated with chiropractic care.

A recent study in the *New England Journal of Medicine* reported that primary care physicians deliver care for low back pain at the lowest cost. The highest cost of care resulted from services provided by chiropractic or orthopedic providers (Carey et al. 1995). These results were criticized by the American Chiropractic Association (ACA). In rebuttal, the ACA stated the charges were skewed because the study ignored the costs of hospitalization. The ACA pointed out that the NEJM study was inconsistent with an ongoing study by Dr. Miron Stano, Professor of Economics and Management at Oakland University's School of Business

Administration. According to the preliminary findings, this study consisting of more than 400,000 patients, found that a chiropractic patient saves his or her insurance company approximately \$500.00 per year, and chiropractic patients treated for low back conditions incurred much lower costs than those treated by medical doctors (ACA 1995).

To further substantiate claims of lower health care costs by treating low back pain with chiropractors vice medical practitioners, the ACA points to a recently released study. The study (Arnold et al.) in the March 1996 issue of *The American Journal of Managed Care*, found that the cost per patient for chiropractic treatment was \$539, compared to \$774 for medical care. The study further concluded that the higher cost of medical treatment was no indication of the quality of care because patient outcomes and satisfaction was identical (ACA Online 1996).

Authorities in the treatment of low back pain believe that low back pain represents the greatest and most inefficient area of health care expenditures, and hence constitutes the greatest opportunity for savings (Burton and Cassidy 1992). With this in consideration, chiropractic cost effectiveness will be an important element to be evaluated by the CHCDP Oversight Advisory Committee. This Graduate Management Project does not include a detailed cost

analysis of the CHCDP because of the short time the CHCDP has been in existence. Furthermore, to be conclusive, a costing methodology would have to be developed for use across all ten CHCDP sites. For information purposes, Fiscal Year 1996 baseline chiropractic contract costs for Naval Hospital, Jacksonville is approximately \$212,000.00. These contract costs cover four FTEs (two chiropractors/two chiropractor assistants) to staff the chiropractic clinic.

Purpose (Hypothesis/Working Variables)

The medical treatment and absenteeism costs related to functional disability resulting from lower back pain is enormous. There exists a need to appropriately and accurately measure this functional disability as a treatment outcome to validate the efficacy of treatment delivered. With initiation of the CHCDP, the Oversight Advisory Committee will evaluate the effectiveness and efficiency of chiropractic care delivered to beneficiaries in the DOD MHSS. Partial data collection for the committee's analysis will be made by a patient four week follow-up survey (provided as Appendix B) and a Modified Roland-Morris Spine Related Pain and Disability Questionnaire (see Appendix C). This questionnaire provides a disability baseline score, but does not provide a means of tracking daily functional disability changes. Improvements in data collection

relative to functional disability outcome changes as a result of treatment, are possible with using a Modified Oswestry Pain Questionnaire as the outcome measurement tool.

The purpose of this Graduate Management Project is to provide Naval Hospital, Jacksonville with a methodology to evaluate the outcome (functional disability) effectiveness of chiropractic treatment provided to patients presenting with lower back pain. This project's working hypothesis is that patient perceived functional disability resulting from lower back pain (dependent variable - y) will change over time as a result of receiving chiropractic health care services (independent variable - x). To further validate the measurement tool used, and to evaluate the efficacy of care rendered to patients with lower back pain by physical therapists at Naval Hospital, Jacksonville, a second hypothesis will be tested. This second hypothesis is that patient perceived functional disability resulting from lower back pain (y) will change over time as a result of receiving physiotherapy health care services (x).

METHODS AND PROCEDURES

Modified Oswestry Disability Questionnaire

The outcome measurement tool selected for this management project is the Modified Oswestry Pain

Questionnaire (MOPQ) which has been shown to be responsive to change in studies of patients with low back pain (Delitto et al. 1993). An MOPQ is provided as Appendix (1). Low back pain is a major health problem (Polatin et al. 1989). The consequences of low back pain are, very often, a reduction in the level of functional activity of the individual (Deyo 1988). Therefore, it is critical to make a thorough assessment of the patient's function. The particular assessment tool, must be both reliable and valid (Williams 1985).

As reported by Strong, Ashton and Large, reliability of the MOPQ as measured by examining the internal consistency of the scales resulted in a Cronbach's coefficient of .71 and the test-retest reliability to be .83 (Strong, Ashton, and Large 1994). High test-retest reliability ($r=.99$) was reported when the questionnaire was assessed on consecutive days and has displayed significant positive change over a 3-week period in a group of patients with a high likelihood of spontaneous recovery (Fairbank et al. 1980). The validity of the MOPQ was suggested by observing expected improvements among patients with a first episode of low back pain (Fairbank et al. 1980). Further evidence of validity was subsequently provided by demonstrating the expected correlations with trunk mobility and muscle function in

patients with back pain, and with the Waddell Disability Index (Deyo 1988). "The questionnaire is a valid indicator of disability" (Fairbank et al. 1980, 271). However, one problem, when assessing change over time for qualities such as pain and function, is that there is no existing "gold standard" (Stratford et al. 1994).

The MOPQ is an easily administered, disease specific, self-report instrument that provides an index of a patient's perceived disability based on ten areas of limitations in performance (Fairbank et al. 1980). These areas are pain intensity; changes in the status of pain; and the ability to perform personal hygiene, lifting, walking, sitting, standing, sleeping, social activity, and travel. Each section is scored on a six-point scale (0-5), with zero representing no limitation and five representing a maximal limitation. The subscales added together yield a maximum score of 50. The score is doubled and interpreted as a percentage of the patient-perceived disability (i.e., the higher the score, the greater the disability (Erhard et al. 1994)). Appendix A2 provides Oswestry interpretation categories based on the scored percentage.

The combination of closed questions and self-administration in a tool like the MOPQ has demonstrated to be a reliable format (Collen et al. 1969). There is

evidence that this type of questionnaire is comparable with data collected by an interviewer (Young 1972). However, subjective responses have some limitations. The response may be inaccurate for several reasons. The person must rely on memory processes to answer the question, which may be distorted by the effects of time or influenced by comparisons with the present evaluation. The patient's estimate may be biased by other expectations, such as an attempt to increase compensation (with increased disability) or to please the health care provider by reporting favorably (Love, Crisp and Leboeuf 1989). Another limitation of the MOPQ has been that symptom magnification may result in unrealistic scores when compared to the patient's physical presentation. This may be due to the manifestation of psychological distress in patients with lower back pain (Waddell et al. 1984).

Sample/Instrumentation/Procedures

Patients presenting to the Chiropractic Clinic at Naval Hospital, Jacksonville with a chief complaint of low back pain from 26 January 1996 to 15 May 1996 were eligible for the project sample. To ensure CHCDP contract constraints were met, chiropractor patients were first screened using the ten question CHCDP Patient Screening Checklist (see Appendix D).

Patients were asked by the clinic administrative clerks to voluntarily fill out an MOPQ and sign a privacy act statement (See Appendix E) at the initial patient encounter. Only those patients who signed the statement and voluntarily provided the MOPQ information were included in the project. This equated to a sample size of $n = 40$. All ethical rights of the patients were maintained with eventual MOPQ results presented with individual patient anonymity maintained. The convenience sample of beneficiaries treated at the chiropractic clinic is considered representative of the population of interest, namely, DOD MHSS eligible beneficiaries to be treated under the CHCDP at Naval Hospital, Jacksonville.

Instructions to fill out the MOPQ were written on the questionnaire. The MOPQ was reviewed by the treating chiropractor during the initial patient evaluation. Those patients requiring neurosurgeon, orthopedic, or physician referral as determined during the evaluation, were not included in this project. As discussed above, the reliability and construct validity of the MOPQ self administration tool is high.

Subsequent to treatment (approximately 3-5 weeks), follow-up MOPQs were filled out by the patient. This group of MOPQs provided the post-treatment data points for a pre-

post treatment statistical analysis of chiropractic treatment rendered.

The Physical Therapy Clinic at Naval Hospital, Jacksonville has used the MOPQ as a tool to gauge functional disability of patients treated over the past few years. To support the validity of the MOPQ and to provide a comparative group of MOPQ scores for low back pain patients treated by another modality, a retrospective record review was completed for additional MOPQ data points. Filed MOPQ records were screened for patients who were treated with a chief complaint of low back pain which met the same criteria as the CHCDP Patient Screening Checklist, and the same approximate time of follow-up screening as used in the chiropractor data gathering process. These records were pulled by the Physical Therapy staff and provided with patient anonymity maintained. The record review provided a comparative sample of pre-post treatment scores with n=97.

Collected MOPQs were scored as discussed above. These scores represent the dependent variable (y) data (MOPQ scores) coded continuously. The independent variable (x) was binary coded as one for treatment, zero for no treatment. The difference in pre and post treatment MOPQ scores were measured for statistical significance using a repeated measure's students t for paired observations. The

critical probability level (α) selected was .05.

RESULTS

Descriptive statistics calculated with Quattro Pro software for collected MOPQ scores are provided in Tables two through five. When comparing pre and post treatment MOPQ scores for both chiropractic and physical therapy treatment modalities, lower means were calculated for the post treatment scores indicating evidence of patient outcome improvements as a result of treatment from both modalities.

A repeated measure's students t test for paired observations was completed using Quattro Pro software for both the chiropractor and physical therapy data points to test the hypothesis for statistical significance and is provided in Tables six and seven.

TABLE 2
Chiropractor Pre-Treatment

Mean	39.00
Standard Error	2.37
Median	38.00
Mode	36.00
Standard Deviation	14.99
Variance	224.82
Kurtosis	-0.05
Skewness	-0.18
Range	62.00
Minimum	8.00
Maximum	70.00
Sum	1560.00
Count	40.00
Confidence Level (0.95)	4.65

TABLE 4
Phys Therapy Pre-Treatment

Mean	38.58
Standard Error	1.49
Median	38.00
Mode	32.00
Standard Deviation	14.64
Variance	214.25
Kurtosis	-0.29
Skewness	0.05
Range	70.00
Minimum	6.00
Maximum	76.00
Sum	3742.00
Count	97.00
Confidence Level (0.95)	2.91

TABLE 3
Chiropractor Post-Treatment

Mean	27.60
Standard Error	2.52
Median	26.00
Mode	26.00
Standard Deviation	15.93
Variance	253.78
Kurtosis	-0.92
Skewness	0.12
Range	56.00
Minimum	0.00
Maximum	56.00
Sum	1104.00
Count	40.00
Confidence Level (0.95)	4.94

TABLE 5
Phys Therapy Post-Treatment

Mean	31.48
Standard Error	1.78
Median	30.00
Mode	26.00
Standard Deviation	17.58
Variance	308.94
Kurtosis	-0.32
Skewness	0.39
Range	74.00
Minimum	0.00
Maximum	74.00
Sum	3054.00
Count	97.00
Confidence Level (0.95)	3.50

Table 6

Chiropractic Treatment t test

Pre-Post: Paired Two-Sample for Means

	<i>Variable 1 (Pre)</i>	<i>Variable 2 (Post)</i>
Mean	39.00	27.60
Variance	224.82	253.78
Observations	40.00	40.00
Pearson Correlation	0.58	
Pooled Variance	239.30	
Hypothesized Mean Difference	0.00	
df	39.00	
t	5.07	
P(T<=t) one-tail	5.03E-06	
t Critical one-tail	1.68	
P(T<=t) two-tail	1.01E-05	
t Critical two-tail	2.02	

Table 7

Phys Therapy Treatment t test

Pre-Post: Paired Two-Sample for Means

	<i>Variable 1 (Pre)</i>	<i>Variable 2 (Post)</i>
Mean	38.58	31.48
Variance	214.25	308.94
Observations	97.00	97.00
Pearson Correlation	0.76	
Pooled Variance	261.59	
Hypothesized Mean Difference	0.00	
df	96.00	
t	6.08	
P(T<=t) one-tail	1.20E-08	
t Critical one-tail	1.66	
P(T<=t) two-tail	2.39E-08	
t Critical two-tail	1.98	

These statistically significant results are provided in

standard form as follows:

Chiropractor Pre-Post Test: $t(39), = 5.07, p < .001$

Phys Therapy Pre-Post Test: $t(96), = 6.08, p < .001$

This data provides strong evidence to support the research hypothesis. Based on these results, the null hypothesis is rejected and the research hypothesis is accepted. The probabilities that these results are due to chance alone are less than one in 1000. The data does support the research hypothesis in that patient functional disability scores appear to improve over time as a result of chiropractic treatment for low back pain complaints. Further, the data provides strong evidence to support the second hypothesis in that patients seeing a physical therapist for the treatment of lower back pain will see an improvement in functional disability scores over time as a result of that treatment. Again, the probabilities that these results are due to chance alone are less than one in 1000.

Analysis of Results

Functional disability scores using the MOPQ were taken on 40 sample patients prior to chiropractic treatment measuring on average 39.0 ± 14.99 using a 1-100 scale. After treatment, the sample patient disability scores were measured again averaging 27.6 ± 15.93 . On the average, we

would expect a decline of 11.4 scale points indicating an improvement in patient functional disability. The reported difference between pre and post treatment disability scores was statistically significant.

Functional disability scores using the MOPQ were analyzed on 97 sample patients prior to physical therapy treatment (retrospective review) measuring on average 38.58 ± 14.64 using a 1-100 scale. After treatment, the sample patient disability scores taken again averaging 31.48 ± 17.58 scale points. On the average, we would expect a decline of 7.1 scale points indicating an improvement in patient functional disability as a result of physical therapy treatment for low back pain. The reported difference between pre and post treatment scores was statistically significant.

Analysis of Variance

An ANOVA table, produced with Quattro Pro software, was completed to determine the amount of variance explained in the analysis. The ANOVA results are shown in tables eight and nine.

Table 8

Chiropractor Clinic
Anova: Two Way Without Replication
Analysis of Variance

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F-crit</i>
Rows (Subjects)	14720.80	39	377.46	3.73	3.9E-05	1.70
Columns (Treatments)	2599.20	1	2599.20	25.70	1.0E-05	4.09
Error	3944.80	39	101.15			
Total	21264.80	79				

Table 9

Physical Therapy Clinic
Anova: Two Way Without Replication
Analysis of Variance

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F-crit</i>
Rows (Subjects)	43897.81	96	457.27	6.94	4.4E-19	1.40
Columns (Treatment)	2439.92	1	2439.92	37.01	2.4E-08	3.94
Error	6328.08	96	65.92			
Total	52665.81	193				

Using the ANOVA table results and the Baylor EPM method (Finstuen, 1989) formulas ($\text{Total } R^2 = 1 - (\text{ESS}/\text{TSS})$; $\text{Treatment } R^2 = \text{CSS}/\text{TSS}$; $\text{Subject } R^2 = \text{RSS}/\text{TSS}$), the R^2 for chiropractic treatment was calculated at .1222 with a subject R^2 of .6923 for a total R^2 of .8145. Variances accounted for in the physical therapy modality MOPQ data points were calculated with a treatment R^2 of .0463, subject R^2 of .8335, and a total R^2 of .8798. The size of variance accounted for by the subjects in both treatment modalities supports prior low

back pain research. The subject effect is the predominant phenomena.

DISCUSSION

The costs associated with the treatment of low back pain are enormous. As the incidence of people suffering from low back pain continues to escalate to almost epidemic proportions, the costs continue to spiral out of control. Common sense dictates that to combat this problem, find treatment modalities whose results can be proven effective via reliable outcome measurements. As a tool, outcome measurements have become a key factor in health care decision making as the country's delivery system continues to be influenced by managed care.

As the DoD MHSS transitions to managed care under TRICARE and in conjunction with the CHCDP demonstration project, this management project provides a methodology to demonstrate medical outcomes research of chiropractic treatment of low back pain within our health care delivery system. Using the Oswestry pain questionnaire as a measurement tool of patient perceived disability from low back pain, this project provides strong evidence to support the effectiveness of chiropractic and physical therapy treatment of low back pain. This evidence is consistent with previous research outside the DoD MHSS.

The data indicates that the functional disability outcome measurement for patients treated for low back pain by a physical therapy modality at Naval Hospital, Jacksonville, is expected to improve on average by 7.1 percent. However, from a value added perspective, disability outcome scores for patients treated by chiropractors at the same hospital for the same complaint, can be expected to improve on average by 11.4 percent, an increase of 4.3 percent.

This project provides Naval Hospital, Jacksonville, with strong evidence to support the effectiveness of the CHCDP in the treatment of low back pain. In conjunction with the favorable results shown from the physical therapy modality, a multi-disciplined approach to evaluating and treating patients with low back pain is indicated. A concerted team effort among the physical therapy department, the chiropractor clinic, and other health care practitioners, would appear to be the logical approach in establishing treatment guidelines for the best possible treatment outcome for the patient. Traditional health care practitioner acceptance of chiropractors at Naval Hospital, Jacksonville, is necessary.

Results of this project can provide the CHCDP Oversight Committee with another treatment outcome tool in determining

the demonstration project's treatment effectiveness from a functional disability perspective. Using the Oswestry questionnaire, a disability baseline can be determined and monitored. Also, these results may provide the impetus for the CHCDP Oversight Committee to focus on the cost effectiveness of chiropractic care using an Activity-based Cost (ABC) approach. Since this project demonstrated the treatment effectiveness of both chiropractic care and of physical therapy treatment for a common ailment, the evaluation of the CHCDP by the Oversight Committee, may require more emphasis to be placed on the cost analysis. If an ABC approach is used, it is my belief that the chiropractic treatment costs will be lower than other treatment modalities when considering the lower ancillary (drug) and inpatient costs.

CONCLUSIONS AND RECOMMENDATIONS

This project appears to indicate that chiropractic and physical therapy treatment for patients with low back pain at Naval Hospital, Jacksonville, is effective in improving the patient's perceived functional disability as determined by use of the Oswestry questionnaire. This project's data analysis methodology gives this hospital with a tool to monitor the CHCDP from an outcomes perspective.

It is recommended that the CHCDP Oversight Committee

evaluate the Oswestry as a tool to monitor the effectiveness of the CHCDP. The benefit of using the Oswestry is the ability of the tool to gauge a disability baseline from which to measure a treatment outcome. In addition, the use of an Activity-based Cost methodology to effectively analyze the cost effectiveness of the demonstration project is recommended.

Date _____

THE REVISED OSWESTRY PAIN QUESTIONNAIRE

Please Read: This questionnaire is designed to enable us to understand how much your PAIN has affected your ability to manage your everyday activities. Please answer each Section by circling the ONE CHOICE that most applies to you. We realize that you may feel that more than one statement may relate to you, but **PLEASE JUST CIRCLE THE ONE CHOICE WHICH MOST CLOSELY DESCRIBES YOUR PROBLEM RIGHT NOW.**

SECTION 1 -- Pain Intensity

- A The pain comes and goes and is very mild.
- B The pain is mild and does not vary much.
- C The pain comes and goes and is moderate.
- D The pain is moderate and does not vary much.
- E The pain comes and goes and is severe.
- F The pain is severe and does not vary much.

SECTION 2 -- Personal Care

- A I would not have to change my way of washing or dressing in order to avoid pain.
- B I do not normally change my way of washing or dressing even though it causes some pain.
- C Washing and dressing increase the pain, but I manage not to change my way of doing it.
- D Washing and dressing increase the pain and I find it necessary to change my way of doing it.
- E Because of the pain, I am unable to do some washing and dressing without help.
- F Because of the pain, I am unable to do any washing or dressing without help.

SECTION 3 -- Lifting

- A I can lift heavy weights without extra pain.
- B I can lift heavy weights, but it causes extra pain.
- C Pain prevents me from lifting heavy weights off the floor.
- D Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned, e.g. on a table.
- E Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned.
- F I can only lift very light weights, at the most.

SECTION 4 -- Walking

- A Pain does not prevent me from walking any distance.
- B Pain prevents me from walking more than one mile.
- C Pain prevents me from walking more than 1/2 mile.
- D Pain prevents me from walking more than 1/4 mile.
- E I can only walk while using a cane or on crutches.
- F I am in bed most of the time and have to crawl to the toilet.

SECTION 5 -- Sitting

- A I can sit in any chair as long as I like without pain.
- B I can only sit in my favorite chair as long as I like.
- C Pain prevents me from sitting more than one hour.
- D Pain prevents me from sitting more than 1/2 hour.
- E Pain prevents me from sitting more than ten minutes.
- F Pain prevents me from sitting at all.

SECTION 6 -- Standing

- A I can stand as long as I want without pain.
- B I have some pain while standing, but it does not increase with time.
- C I cannot stand for longer than one hour without increasing pain.
- D I cannot stand for longer than 1/2 hour without increasing pain.
- E I cannot stand for longer than 10 minutes without increasing pain.
- F I avoid standing, because it increases the pain straight away.

SECTION 7 -- Sleeping

- A I get no pain in bed.
- B I get pain in bed, but it does not prevent me from sleeping well.
- C Because of pain, my normal night's sleep is reduced by less than one-quarter.
- D Because of pain, my normal night's sleep is reduced by less than one-half.
- E Because of pain, my normal night's sleep is reduced by less than three-quarters.
- F Pain prevents me from sleeping at all.

SECTION 8 -- Social Life

- A My social life is normal and gives me no pain.
- B My social life is normal, but increases the degree of my pain.
- C Pain has no significant effect on my social life apart from limiting my more energetic interests, e.g., dancing, etc.
- D Pain has restricted my social life and I do not go out very often.
- E Pain has restricted my social life to my home.
- F I have hardly any social life because of the pain.

SECTION 9 -- Traveling

- A I get no pain while traveling.
- B I get some pain while traveling, but none of my usual forms of travel make it any worse.
- C I get extra pain while traveling, but it does not compel me to seek alternative forms of travel.
- D I get extra pain while traveling which compels me to seek alternative forms of travel.
- E Pain restricts all forms of travel.
- F Pain prevents all forms of travel except that done lying down.

SECTION 10 -- Changing Degree of Pain

- A My pain is rapidly getting better.
- B My pain fluctuates, but overall is definitely getting better.
- C My pain seems to be getting better, but improvement is slow at present.
- D My pain is neither getting better nor worse.
- E My pain is gradually worsening.
- F My pain is rapidly worsening.

From: N.Hudson, K.Tome-Nicholson, A.Breen; 1989

REVISED 9/25/91

A1

Comments: _____

APPENDIX A₂

OSWESTRY INTERPRETATION

Categories

0% - 20% : Minimal (low) Disability

This group of patients can cope with most activities of daily living. If their occupation requires considerable sitting or driving; some advice on lifting, sitting, sitting posture, physical fitness and diet would be indicated.

21% - 60% : Severe (High) Disability

This group experiences more pain and problems with sitting, lifting, and standing. Travel and social life are more difficult and they may be off work. Personal care and sleeping are not grossly affected, and the back condition can usually be managed by conservative means.

41% - 60% : Severe (High) Disability

Pain remains the main problem in this group of patients, but travel personal care, social life, and sleep are also effected. These patients require detailed investigation.

61% - 100% : Non-functional (Very High) Disability

These patients are either bedrest or exaggerating their symptoms. Back pain impinges all aspects of these patients' life both at home and at work. These patients require a careful evaluation to include the Waddell test.

Chiropractic Health Care Demonstration Program (CHCDP)
Patient Four Week Follow-Up Survey (Page 1 of 3)

FOR OFFICIAL USE ONLY

Control Number

Control Date

MTF/Clinic

INSTRUCTIONS: You have chosen to participate in a special demonstration program at this medical treatment facility. Your responses to these questions will provide important information about the services we offer at this facility. Your participation in this survey is voluntary, and all responses will be kept strictly confidential. Please read and answer all questions carefully. Thank you for your cooperation.

Name Date

(Last) (First) (MI)

(Date of Birth) Sponsor's SSN Relationship To Sponsor Sex: ☐ Male ☐ Female

Approximately four weeks ago, you received treatment for a spinal or related problem. Please answer all questions below about that specific problem. Check only one box for each question unless otherwise instructed.

1. Do you still have a spinal or related problem? ☐ Yes ☐ No

2. What is the status of your treatment for this problem?

- a. ☐ I am still under treatment.
- b. ☐ I left treatment on my own.
- c. ☐ I finished all treatment recommended by my clinician.
- d. ☐ Other: _____

3. What is your current level of pain?

Severe ☐ ☐ ☐ ☐ ☐ None
5 4 3 2 1

4. What is your current level of activity?

Very ☐ ☐ ☐ ☐ ☐ Not
Restricted 5 4 3 2 1 Restricted

5. How would you rate your overall health status?

Excellent ☐ ☐ ☐ ☐ ☐ Poor
5 4 3 2 1

6. Which of the following best describes you today:

- a. ☐ I have returned to normal activities with no restrictions.
- b. ☐ I have returned to normal activities with some restrictions.
- c. ☐ I have not returned to normal activities.

7. Over the last four weeks, how satisfied were you with the following:

- a. The ease of making an appointment?
- b. The length of time you waited to get an appointment?
- c. The length of time you waited from making an appointment until the visit?
- d. The waiting time in the clinician's office?
- e. The convenience of the clinician's location?

Very ☐ ☐ ☐ ☐ ☐ Very
Satisfied 5 4 3 2 1 Dissatisfied

Very ☐ ☐ ☐ ☐ ☐ Very
Satisfied 5 4 3 2 1 Dissatisfied

Very ☐ ☐ ☐ ☐ ☐ Very
Satisfied 5 4 3 2 1 Dissatisfied

Very ☐ ☐ ☐ ☐ ☐ Very
Satisfied 5 4 3 2 1 Dissatisfied

Very ☐ ☐ ☐ ☐ ☐ Very
Satisfied 5 4 3 2 1 Dissatisfied

B

(over)

Chiropractic Health Care Demonstration Program (CHCDP)
Patient Four Week Follow-Up Survey (Page 2 of 3)

8. In the past four weeks, how many visits have you had for your spine-related problem?

- a. Emergency room visits. Visits
- b. Walk-in visits (no appointment made). Visits
- c. Scheduled visits (appointment made ahead of time). Visits

9. Over the last four weeks, which clinicians have you seen for this problem? (Check all that apply.)

- a. ☐ Chiropractor
- b. ☐ Emergency Room Physician
- c. ☐ General Practitioner
- d. ☐ Internist
- e. ☐ Neurosurgeon
- f. ☐ Orthopedist
- g. ☐ Physical Therapist
- h. ☐ Pain clinic clinician
- i. ☐ Other: _____

10. Who did you last see for this problem? (Check all that apply.)

- a. ☐ Chiropractor
- b. ☐ Emergency Room Physician
- c. ☐ General Practitioner
- d. ☐ Internist
- e. ☐ Neurosurgeon
- f. ☐ Orthopedist
- g. ☐ Physical Therapist
- h. ☐ Pain clinic clinician
- i. ☐ Other: _____

11. How would you rate the clinician you last saw for this problem:

- a. Overall "bedside" manner.
- b. Amount of time spent with you.
- c. Ability to explain your treatment.
- d. Ability to build trust in the method of treatment.
- e. Ability to help you with your problem.

Excellent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Poor
	5	4	3	2	1	
Excellent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Poor
	5	4	3	2	1	
Excellent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Poor
	5	4	3	2	1	
Excellent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Poor
	5	4	3	2	1	
Excellent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Poor
	5	4	3	2	1	

Chiropractic Health Care Demonstration Program (CHCDP)
Patient Four Week Follow-Up Survey (Page 3 of 3)

12. Over the last four weeks, did you receive any treatment for this problem outside the military medical facility?

☐ Yes ☐ No

If you answered "no", skip to question 15.

13. If you answered "yes" to the last question, who provided treatment outside the military medical facility? Check all that apply:

- a. ☐ Chiropractor
- b. ☐ Emergency Room Physician
- c. ☐ General Practitioner
- d. ☐ Internist
- e. ☐ Neurosurgeon
- f. ☐ Orthopedist
- g. ☐ Physical Therapist
- h. ☐ Pain clinic clinician
- i. ☐ Other: _____

14. What treatment did you receive outside the military medical facility? Check all that apply:

- a. ☐ Bed rest
- b. ☐ Prescription medication
- c. ☐ Spinal manipulation
- d. ☐ Heat
- e. ☐ Surgery
- f. ☐ Other: _____

15. In thinking about the treatment you have received over the last four weeks, how strongly do you agree or disagree with the following?

- a. I had good results from the treatment.
- b. I feel better now.
- c. My pain is worse now.
- d. I had a good experience with my clinician.
- e. I expect my health to decline.

Strongly Agree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Strongly Disagree
	5	4	3	2	1	
Strongly Agree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Strongly Disagree
	5	4	3	2	1	
Strongly Agree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Strongly Disagree
	5	4	3	2	1	
Strongly Agree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Strongly Disagree
	5	4	3	2	1	
Strongly Agree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Strongly Disagree
	5	4	3	2	1	

For active duty personnel only:

- a. How many days have you been off duty over the last four weeks due to this problem?

Days

- b. How many days have you been on restricted duty over the last four weeks due to this problem?

Days

Spine-Related Pain And Disability Questionnaires

FOR OFFICIAL USE ONLY

Control Number

Control Date

N01
MTF/Clinic

Name

(Last)

(First)

(MI)

 / /

MM / DD / YY

DOB

 / /

MM / DD / YY

Sponsor's SSN

Relationship to Sponsor

Sex: ☐ Male ☐ Female

PAIN SCALE: Rate the severity of your pain (due to your spine-related problem) by checking one box on the following scale.

Excruciating Pain ☐ 10 ☐ 9 ☐ 8 ☐ 7 ☐ 6 ☐ 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ 0 No Pain

When you hurt, because of your spine-related condition, you may find it difficult to do some of the things you normally do. This list contains some sentences that people have used to describe themselves when they have pain due to a spine-related problem. When you read them, you may find that some stand out because they describe you today. As you read the list, think of yourself today. When you read a sentence that describes you today, check the box. If the sentence does not describe you, then leave the space blank and go to the next one. Remember, only check the sentence if you are sure that it describes you today.

- a. ☐ I stay in most of the time because of my spine-related problem.
- b. ☐ I change position frequently to try and get comfortable due to my spine-related problem.
- c. ☐ I walk more slowly than usual because of my spine-related problem.
- d. ☐ Because of my problem, I am not doing any jobs that I usually do.
- e. ☐ Because of my problem, I use a handrail to get upstairs.
- f. ☐ Because of my problem, I lie down to rest more often.
- g. ☐ Because of my problem, I have to hold on to something to get out of an easy chair.
- h. ☐ Because of my spine-related problem, I try to get other people to do things for me.
- i. ☐ I get dressed more slowly than usual because of my problem.
- j. ☐ I only stand up for short periods of time because of my problem.
- k. ☐ Because of my problem, I try not to bend or kneel down.
- l. ☐ I find it difficult to get out of a chair because of my problem.
- m. ☐ I am in pain almost all of the time because of my spine-related problem.
- n. ☐ I find it difficult to turn over in bed because of my problem.
- o. ☐ My appetite is not very good because of my problem.
- p. ☐ I have trouble putting on my socks (or stockings) because of my problem.
- q. ☐ I only walk short distances because of my problem.
- r. ☐ I sleep less well because of my spine-related problem.
- s. ☐ Because of my problem, I get dressed with help from someone else.
- t. ☐ I sit down for most of the day because of my problem.
- u. ☐ I avoid heavy jobs because of my problem.
- v. ☐ Because of my problem, I am more irritable and bad tempered with people than usual.
- w. ☐ Because of my spine-related problem, I go upstairs more slowly than usual.
- x. ☐ I stay in bed most of the time because of my spine-related problem.

Rvsd. 10/95

Chiropractic Health Care Demonstration Program (CHCDP)
Patient Screening Checklist

FOR OFFICIAL USE ONLY

Control Number

Control Date

MTF/Clinic

Name

Date

(Last)

(First)

(MI)

Date of Birth

Sponsor's SSN

Relationship to Sponsor

Sex: ☐ Male ☐ Female

INSTRUCTIONS: Please ask each patient presenting with a spine-related complaint the 10 questions listed below. Make sure that the patient responds with a "yes" or "no" to each question. Please mark the patient's response clearly in the box next to each question. *Do not skip any questions.*

- ☐ Yes ☐ No 1. Are you 17 years of age or under?
- ☐ Yes ☐ No 2. (If female) Are you now or could you be pregnant?
- ☐ Yes ☐ No 3. Have you been injured or experienced physical trauma within the last 10 days?
If yes, please describe _____
- ☐ Yes ☐ No 4. Do you have any history of fracture of the spine?
- ☐ Yes ☐ No 5. Do you have osteoporosis?
- ☐ Yes ☐ No 6. Do you have a history of any of the following:
- ☐ Yes ☐ No a. Spinal surgery?
- ☐ Yes ☐ No b. Cancer?
- ☐ Yes ☐ No c. Fever, chills, or unexplained weight loss within the last 10 days?
- ☐ Yes ☐ No 7. Do you have severe pain that awakens you at night?
- ☐ Yes ☐ No 8. If yes, does the pain get worse when lying down?
- ☐ Yes ☐ No 9. Have you had a change in bowel, bladder, or sexual function within the last 30 days?
- ☐ Yes ☐ No 10. Is there a loss of sensation or weakness anywhere in your body?

This section to be completed by screener:

- | | |
|---|--|
| <input type="checkbox"/> Patient answered "yes" to question 1 or 2. Patient is ineligible for chiropractic care. | <input type="checkbox"/> Patient chose chiropractic care. |
| <input type="checkbox"/> Patient answered "no" to all questions. Patient is eligible for chiropractic care. | <input type="checkbox"/> Patient did not choose chiropractic care. |
| <input type="checkbox"/> Patient answered "yes" to one or more of questions 3 through 10. Patient must be seen by a physician for additional screening. | <input type="checkbox"/> Patient did not choose at this time. |

Screener Signature: _____ Date: _____

Patient Signature: _____ Date: _____

The screener gives copy of the form to the patient, places copy in the patient's medical record, and returns copy to a central collection box designated by the department administrator.

D

PRIVACY ACT STATEMENT

Authority: 5 USC 301; Sections 133, 1071-87,3012, 5031, and 8012, title 10, United States Code and Executive Order 9397.

Purpose: Medical research information will be collected to enhance basic medical knowledge, or to develop tests, procedures, and equipment to improve the diagnosis, treatment, or prevention of illness, injury or performance.

Uses: Information will be used for statistical analysis of treatment provided to improve treatment outcome tools.. There is no experimental treatment or risks/discomforts possible in this survey. This information will assist a graduate student in the completion of a Graduate Management Project for the U.S.A.-Baylor University Program in Health Care Administration.

Disclosure: Disclosure is voluntary. Information will be retained at Naval Hospital, Jacksonville and salient portions may be entered into my health record. Refusal to provide requested information will in no way effect care provided.

Signature _____ Date _____

REFERENCES CITED

- Adams, Renee C. "In Search of Straight Talk in Manual Therapy." Advance for Physical Therapists. October 23, 1995: 18-19.
- American Chiropractic Association. "What is Manipulation and How Can it Help Me?" January, 1995.
- American Chiropractic Association. "Chiropractors Applaud New England Back Study for its Focus on Patient Satisfaction, But Criticize Cost-Effectiveness Figures." News Release. October 5, 1995.
- American Chiropractic Association. "What's New." ACA Online. <http://www/cais.net.aca>. 1996.
- Assendelft W. J., and L. M. Bouter. "Does the Goose Really Lay Golden Eggs? A Methodological Review of Workmen's Compensation Studies." Journal of Manipulative and Physiological Therapeutics. 1993: 16 (3): 161-168.
- Ballantine, H. T. Jr. "Will Delivery of Health Care Be Improved By the Use of Chiropractic Care?" New England Journal of Medicine. 1972: 286(5): 237-242.
- Battie, M. C., D. C. Cherkin, R. Dunn, M. A. Ciol, and K. J. Wheeler. "Managing Low Back Pain: Attitudes and Treatment Preferences of Physical Therapists." Physical Therapy. Vol. 74, No. 3. March 1994: 33-40.
- Bigos S., O. Bowyer, G. Braen, et al. "Acute Low Back Problems in Adults, Clinical Practice Guideline No. 14." AHCPR Publication No. 95-0642. Rockville, MD: Agency for Health Care Policy and Research, Public Health Service, U. S. Department of Health and Human Services. December 1994.
- Binkley J., T. Black, E. Finch, C. Gowland, and J. Hall. "Diagnostic Classification of Patients With Low Back Pain: Report on a Survey of Physical Therapy Experts." Physical Therapy. 1993: 8-20.

- Boyle, M. J., and K. W. Zucker. Health Law Volume II. Fourth Ed. Army Medical Department Center and School, Ft. Sam Houston, TX.
- Brodie, D. J., J. V. Burnett, D. Lydes-Reid, and J. M. Walker. "Evaluation of Low Back Pain by Patient Questionnaires and Therapist Assessment." Journal of Orthopedic and Sports Physical Therapy. 1990: 11: 519-529.
- Buerger, A. A. "A Non-Redundant Taxonomy of Spinal Manipulative Techniques Suitable for Physiologic Explanation." Manual Medicine. 1984: 1: 54-8.
- Burton, C. V. and J. D. Cassidy. 1992. "Economics, Epidemiology and Risk Factors." in Kirkaldy-Willis, W. H., and C. V. Burton (eds), Managing Low Back Pain Third Ed. New York: Churchill Livingstone: Chapter 1.
- Carey, T. S., J. Garrett, A. Jackman, et al. "The Outcomes and Costs of Care For Acute Low Back Pain Among Patients Seen by Primary Care Practitioners, Chiropractors, and Orthopedic Surgeons." New England Journal of Medicine. 1995: 353 (14): 913-7.
- Cassidy, J. D. and W. H. Kirkaldy-Willis. 1988. "Manipulation." in Kirkaldy-Willis, W. H. (Ed), Managing Low Back Pain, Second Ed. New York: Churchill Livingstone: 287-296.
- Cherkin D. C., A. O. Berg, and F. A. MacCornack. "Managing Low Back Pain: A Comparison of the Beliefs and Behaviors of Family Medicine Physicians and Chiropractors." Western Journal of Medicine. Vol. 149, No. 4, 1988: 475-80.
- Chiropractic Online. Chiropractic Online Home Page. <http://www.cais.net/aca>. 1995.
- Collen, M. F., R. L. Cella, J. L. Cutler, and A. B. Siegelau. "Reliability of the Self-Administered Questionnaire." Internal Medicine. 1969: 123: 664.
- Darr, Kurt, Beaufort B. Longest, and Johnathon S. Rakich. 1992. Managing Health Services Organizations. Third Ed. Baltimore, MD: Health Professions Press, Inc.
- Davies, A. R., and J. E. Ware. "Involving Consumers in Quality of Care Assessment." Health Affairs. 1988: (7): 33-48.

- Dean, H., and R. Schmidt. "A Comparison of the Cost of Chiropractors Versus Alternative Medical Practitioners." Virginia Chiropractic Association. 1992.
- Delitto, A. R. E. Erhard, M. T. Cibulka, et al. "Evidence For an Extension/Mobilization Category in Acute Low Back Pain: A Prescriptive Validity Pilot Study." Physical Therapy. 1993: 73: 216-228.
- DeRosa C. P. "Diagnostic Classification of Patients with low back Pain: Report on a Survey of Physical Therapy Experts-Commentary." Physical Therapy. Vol. 73. No. 3. March 1993: 138-9.
- DeRosa, C. P. and J. A. Porterfield. "A Physical Therapy Model for the Treatment of Low Back Pain." Physical Therapy. Vol. 72, No. 4, April 1992: 261-69.
- Deyo, R. A. "Measuring Functional Status of Patients With Low Back Pain." Medical Rehabilitation. 1988: 69: 1044-1053.
- Deyo, R. A., and A. K. Diehl. "Measuring Physical and Psychosocial Function in Patients With Low Back Pain." Spine. 1983: 8: 635-642.
- Deyo R. A., D. C. Cherkin, and D. Conrad. "The Back Outcome Assessment Team." Health Services. 1990: 25: 733-737.
- Deyo R. A., D. C. Cherkin, D. Conrad, and E. Volinn. "Cost Controversy Crisis: Low Back Pain and the Health of the Public." Annual Review of Health. 1991: Vol. 12, 141-56.
- Deyo, R. A. and Yuh-Jane Tsui-Wu. "Functional Disability Due to Back Pain." Arthritis and Rheumatism. Vol. 30, No. 11, November, 1987: 1247-1253.
- Deyo R. A. and Y. J. Tsui-Wu. "Descriptive Epidemiology of Low Back pain and its Related Medical Care in the United States." Spine. 1987: 12: 264-8.
- Erhard, R. E., M. T. Cibulka, and A Delitto. "Relative Effectiveness of an Extension Program and a Combined Program of Manipulation and Flexion and Extension Exercises in Patients With Acute Low Back Pain." Physical Therapy. Vol. 74, No. 12: December 1994: 1093-1099.
- Ernst, E. "Treatment of Low Back Pain." New England Journal of Medicine. Vol. 332. No. 26, June 1995: 1786.

- Fairbank, J. C., J. Cooper, J. B. Davies, and J. P. O'Brian. "The Oswestry Low Back Pain Questionnaire." Physiotherapy. 1980: 66: 271-273.
- Finstuen, K. "Extension of Margin Sum and Cell Variance to Repeated Measures/Randomized Blocks Analysis of Variance and Criterion-Scaled Regression Analysis." Educational and Psychological Measurement. Vol. 49, No. 2., Summer 1989: 371-373.
- Frank, A. "Low back Pain." British Medical Journal. Vol. 303, April 1993: 901-909.
- Gatterman, M. I., and D. T. Hansen. "Development of Chiropractic Nomenclature Through Consensus." Journal of Manipulative Physiological Therapeutics. 1994: 17: 302-309.
- Haldeman, S. "Presidential Address, North American Spine Society: Failure of the Pathology Model to Predict Back Pain." Spine. 1990: 15(7): 718-724.
- Haldeman S., S. Robboy and M. Shouka. "Computer Tomography, Electrodiagnostic and Clinical Findings in Chronic Workers Compensation Patients With Low Back Pain." Spine. 1988:13:345-350.
- Harris J. S. and C. R. Brigham. "Low Back Pain: Impact, Causes, Work Relatedness, Diagnosis, and Therapy." Occupational and Environmental Medicine Report. 1990: Vol.4: No. 11: 84-86.
- Jarvis K. B., E. K. Morris, and R. B. Phillips. "Cost Per Case Comparison of Back Injury Claims of Chiropractic Versus Medical Management for Conditions With Identical Diagnostic Codes." Journal of Occupational Medicine. 1991: 33 (8): 847-852.
- Jayson, M. I. "A Limited Role for Manipulation." British Medical Journal. 1986: 293: 1454-5.
- Koes, B. W., H. Beckerman, and L. M. Bouter. "Physiotherapy Exercises and Back Pain: A Blinded Review." British Medical Journal. 1991: 302: 1572-1576.
- Kramer, J. S., W. V. Epstein, and J. S. Yelin. "Social and Economic Impacts of 4 Musculoskeletal Conditions: A Study Using National Community-Based Data." Arthritis Rheumatic. 1983: Vol. 26: 901-7.

- Koes, B. W., L. M. Bouter, A. H. Essers, et al. "Randomized Clinical Trial of Manipulative Therapy and Physiotherapy for Persistent Back and Neck Complaints: Results of One Year Follow-Up." British Medical Journal. 1992: 304: 601-5.
- Laros G. S. "Contemporary Conservative Care for Painful Spinal Disorders." In Mayer T. G. Differential Diagnosis of Low Back Pain. Philadelphia: Lea & Febiger: 1991.
- Lauretti, William. "Chiropractic Pain Management: The Path From Alternative to Mainstream." Seminar Presented at Uniformed Services University of the Health Services. Bethesda, MD.. November 21, 1995.
- Love, A., T. C. Crisp, and C. Leboeuf. "Chiropractic Chronic Pain Suffers and Self-Report Assessment Methods." Journal of Manipulative and Physiological Therapeutics. 1989: 12: 21-25.
- Malmivaara, A., T. Aro, U. Hakkinen, L. Heinrichs, et al. "The Treatment of Low Back Pain - Bed Rest, Exercises, or Ordinary Activity?" New England Journal of Medicine. Vol. 332. No. 6, February 6, 1995: 351-55.
- Manga, P., D. E. Angus, C. Papadopoulos, and W. R. Swan. "A Study to Examine the Effectiveness and Cost-Effectiveness of Chiropractic Management of Low-Back Pain." August 1993.
- Manga, P. and T. Campbell. Health Manpower Substitution: A Literature Review. Mimeo, University of Ottawa, 1993.
- Marshall, Grant N., Ron D. Hays, Cathy D. Sherbourne, and Kenneth B. Wells.: The Structure of Patient Satisfaction With Outpatient Medical Care." Rand Corporation: 1994.
- Mathews, J. A., S. M. Grimes, S. B. Mills, et al. "Back Pain and Sciatica: Controlled Trials of Manipulation, Traction, Sclerosant, and Epidural Injections." British Journal of Rheumatism. 1987: 26: 416-23.
- Mayer, T. G. "Spine Functional Restoration." In Rothman R. H., and F. A. Simeone. The Spine. Third Ed. Philadelphia PA: W. B. Saunders Co: 1992:1929.
- Mayer, T. G. And R. J. Gatchel. 1988. Functional Restoration of Spinal Disorders:

The Sports Medicine Approach. Philadelphia, PA: Lea & Febiger.

Melzack, R. and P. D. Wall. 1983. The Challenge of Pain. New York: Basic Books.

Murt, H. A., W. R. Harlan, and P. E. Parsons. "Disability, Utilization, and Costs Associated with Musculoskeletal Conditions: United States." 1980 National Medical Care Utilization and Expenditures Survey, Series C, Analytical Report No. 5, U. S. Dept. Of Health and Human Services Publication No. 86-20405, National Center For Health Statistics, Public Health Service, Washington, DC, U. S. Government Printing Office, September, 1986.

Nachemson A. L. "Advances in Low Back Pain." Clinical Orthopedics. 1985:200:266-278.

Nachemson, A. L. "Advances in Low back Pain." Clinical Orthopedics and Related Research. No. 200, November 1995: 266-278.

National Defense Authorization Act. Sec. 731. "Chiropractic Health Care Demonstration Program." 1995.

Naval Service Medical News. "Chiropractic Care at Naval Hospital Camp Pendleton." Bureau of Medicine and Surgery, Washington DC. Medical News (95-49).

Oths, K. "Communication in a Chiropractic Clinic: How a D.C. Treats His Patients." Culture, Medicine, and Psychiatry 18: 1994: 83-113.

Polatin, P. B., C. Arens, D. Barnes, R. J. Gatchel, H. Mayer, T. G. Mayer. "A Psycho Sociomedical Prediction Model of Response to Treatment by Chronically Disabled Workers with Low-Back Pain." Spine. 1989: 14: 956-61.

Raftis, K. L., and C. A. Warfield. "Spinal Manipulation for Low Back Pain." Hospital Practice. Vol. 24, No. 3, 1989: 89-90.

Ryan, M. P. "Recognizing and Treating the Causes of Low Back Pain." The Canadian Journal of CME. Vol. 5, No. 1, 1993: 49-58.

Shekelle, Paul G. "The Use and Costs of Chiropractic Care in the Health Insurance Experiment." Rand Corporation: 1994.

- Shekelle, P. G., A. H. Adams, M. R. Chassin, E. L. Hurwitz, R. B. Phillips, and R. H. Brook. "The Appropriateness of Spinal Manipulation for Low-Back Pain: Project Overview and Literature Review." Rand Corporation. 1991.
- Shekelle, P. G., and A. H. Adams, M. R. Chassin, E. L. Hurwitz, and R. H. Brook. "Spinal Manipulation for Low-Back Pain." Rand Corporation. 1993.
- Shekelle, P. G., R. Louie, and M. Markovich. "Comparing the Costs Between Provider Types of Episodes of Back Pain Care." Spine. 1995: 20: 221-6.
- Spitzer, W. O. "Quebec Task Force on Spinal Disorders: Scientific Approach to the Assessment and Management of Activity-Related Spinal Disorders." Spine. 1987: 12: S1-S58.
- Spitzer, W. O., F. E. Le Blanc, and M. Dupuis. "Scientific Approach to the Assessment and Management of Activity-Related Spinal Disorders." Spine 1987: 12: 75.
- Spratt, K. F., T. R. Lehmann, H. A. Sayre, and J. N. Weinstein. "A New Approach to the Low Back Pain Examination." Spine. 1990: 15: 96-102.
- Stano M., "A Comparison of Health Care Costs For Chiropractic and Medical Patients." Journal of Manipulative and Physiological Therapeutics. June 1993: 16 (5): 291-299.
- Stratford, P. W., J. Binkley, E. Finch, C. Gill, and P. Solomon. "Assessing Change Over Time in Patients With Low Back Pain." Physical Therapy. Vol. 74, No. 6, June, 1994: 528-533.
- Strong, J., R. Ashton, and R. Large. "Function and the Patient With Chronic Low Back Pain." Clinical Journal of Pain. Vol. 10, No. 3, 1994: 191-196.
- Subcommittee on Taxonomy. "International Association for the Study of Pain: Classification of Chronic Pain." Pain. 1976: 1(suppl):127-134.
- Valkenburg, H. A., and H. C. Haanen. "The Epidemiology of Low Back Pain." In: White, A. A., American Academy of Orthopedic Surgeons Symposium on Low Back Pain. CV Mosby Co. 1982: 9-22.
- Waddell, G. A., "A New Clinical Model for the Treatment of Low Back Pain." Spine. 1987: 12: 632-644.

- Waddell, G. "Simple Low Back Pain: Rest or Active Exercise?" Annals of Rheumatic Diseases. 1993: Vol 52: 317-319.
- Waddell, G., M. Dipaola, I. Gray, C. J. Main, and E. W. Morris. "Chronic Low Back Pain, Psychologic Distress and Illness Behavior." Spine. 1984: 9 (2): 209-213.
- Waddell, G., H. Galloway, C. J. Main, E. W. Morris, P. S. Rae, S. H. Sharmy, and R. M. Venner. "Normality and Reliability in the Clinical Assessment of Backache." British Medical Journal. 1982: 284: 1519-1523.
- Waddell, G., C. J. Main, E. W. Morris, et al. "Normality and Reliability in the Clinical Assessment of Backache." British Medical Journal. Vol. 284. May, 1982: 1519-1523.
- Wiesel S. W., J. M. Cuckler, F. Deluca, F. Jones, R. H. Rothman, and M. S. Zeide. "Acute Low Back Pain: An Objective Analysis of Conservative Therapy." Spine. 1980: 5: 324-30.
- Williams, R. C. "Towards a Set of Reliable and Valid Measures for Chronic Pain Assessment." Pain. 1985: 35: 239-51.
- Wolk, S. "An Analysis of Florida Workers' Compensation Medical Claims For Back-Related Injuries." American Chiropractic Journal. 1988: 27 (7): 50-59.
- Young, D. W. "Comparison of Information Collected by a Questionnaire With That in a Patient's Hospital Record." Methods Medical Research. 1972: 10: 222.